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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/527,873	03/17/2000	Sohaila Shooshtarian	AGX-37	4182

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EXAMINER

LEE, HSIEN MING

ART UNIT PAPER NUMBER

2823

DATE MAILED: 08/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/527,873

Applicant(s)

SHOOSHTARIAN ET AL.

Examiner

Hsien-Ming Lee

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-13,42 and 44-63 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-13,42 and 44-63 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 27.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Remarks

1. Claims 1-2, 4-13, 42, 44-63 are pending in the application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 2, 5, 8-11, 42, 44, 45, 48 are rejected under 35 U.S.C. 102(e) as being anticipated by Collins et al. (US 6,238,588).

In re claims 1, 42, 44, 45, 48, Collins et al. in Figs. 17A-17B and related text, expressly and impliedly teaches the claimed method for heat treating a semiconductor wafer, comprising :

- placing a semiconductor 56 in a thermal processing chamber 40 that is in communication with a plurality of lamps 72 (tungsten-halogen lamps, col. 8, line 64 through col.9, line 2), the semiconductor wafer 56 defining a plurality of localized regions along a radical axis;
- adjusting the temperature of the semiconductor wafer 56 to a predetermined temperature according to a predetermined heat cycle including a heating stage in which the semiconductor wafer 56 is heated by the plurality of lamps 72; and
- during at least one stage of the predetermined heat cycle, providing a gas through gas injection head 64a, 64b, 64c and 64d to selectively control the temperature of at least

one of localized regions of the semiconductor wafer 56 to minimize temperature deviation of the at least one localized region from the predetermined temperature (i.e. to achieve temperature uniformity, col. 14, lines 47-56), the gas being supplied by going through a pedestal 54 below the semiconductor wafer 56 and a plurality of gas outlets 64c extend through the pedestal 54 and the gas being supplied by a gas pipe 64 located above the semiconductor wafer 56, wherein the gas pipe 64 has a plurality of gas outlets 64a and 64d.

In re claims 2 and 5, Collins et al. also teach monitoring the temperature of said at least one localized region with a temperature sensing device 79 (Fig. 17A), said temperature sensing device 79 being in communication with a controller 222 (Fig. 17A); and based on information received by said controller 222 from said temperature sensing device 79, controlling the temperature of said at least one localized region according to said predetermined heat cycle; and controlling the flow rate of the gas (col. 15, lines 1-6 and 33-60)

In re claims 8-10, Collins et al. also inherently teach that said at least one localized region comprises less than about 50% or 25 % or 15 % of a cross-section of said semiconductor wafer because Collins et al. is pursuing the temperature uniformity on every localized region across the entire wafer.

In re claim 11, Collins et al. also inherently teach that said temperature of said at least one localized region is decreased during said heating stage of said predetermined heat cycle because the temperature would increase and decrease within a predetermined cycle and is further controlled within a target range by controller 222 during the process.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 46-47 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. in view of Champetier et al (US 5,997,175).

Collins et al. substantially teach the claimed method, as stated above, but do not teach that the gas is supplied by a reflective device located below the semiconductor wafer.

Champetier et al, in an analogous art of heat treating processing, teach utilizing the reflective device 26 located below the semiconductor wafer 14 (Fig.1), wherein the reflective device 26 is constructed by coating a reflective layer 36 (i.e. highly reflective material such as stainless steel or optical film, col. 12, lines 25-35 and 55-60) on a pedestal.

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to coat the reflective layer on the pedestal, as taught by Champetier et al, so that the pedestal 54 of Collins becomes the reflective device in a such way that gas outlets 64c extending through the reflective device located below the wafer, since by this manner it would intense the heat radiation and ramp rate.

6. Claims 4, 6, 7, 12, 13, 50-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. in view of Cook et al. (US 6,506,691), Horie et al. (US 6,387,182) and Colelli et al. (US 6,100,506).

In re claims 12, 13 and 50, Collins et al. substantially teach the claimed method, wherein the method is pursuing the temperature uniformity while performing etching the material layer formed on the semiconductor wafer.

In contrast, Collins et al. is silent as to the method being applied to a situation that requires a cooling stage, as recited in claim 50 (line 10) and claim 12.

However, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to apply Collins's teachings to a desired situation that requires temperature uniformity across the entire semiconductor wafer during heating and cooling stages such as semiconductor material film deposition, as evidenced by Cook et al. (abstract and col. 2, line 60 through col. 3, line 41), since Collins's teachings is illustrative rather than restrictive; and the application would not depart from the scope and spirit of Collins et al..

In re claim 51, Collins et al. in view of Cook et al. also teach the claimed limitation, as stated above with respect to claim 2.

In re claims 52 and 4, Collins et al. do not teach controlling the temperature of the gas.

However, Horie et al., in an analogous art of heat treating processing, teach controlling the temperature of the gas (col. 14, lines 2-11).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to control the gas temperature, as taught by Horie et al, in the method of Collins et al., since by doing so it would facilitate achieving a desired wafer temperature.

In re claim 53, Collins et al. in view of Cook et al. also teach the claimed limitation, as stated above with respect to claim 5.

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In re claims 54, 55, 6 and 7, Collins et al. or Collins in view of Cook et al. do not teach that the temperature deviation is less than about 100 C (claims 6 and 54) and less than about 25 C (claims 7 and 55).

However, minimizing temperature deviation is always the target in the heat treating processing, as evidenced by Colelli et al., wherein the temperature deviation is minimized to be less than 0.3 C (col. 3, lines 15-17).

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time the invention was made, to minimize the temperature deviation as low as 0.3 C, as taught by Colelli et al., in the process of Collins or Collins in view of Cook et al., since by doing so it would ensure a better performance of the process.

In re claims 56-58, Collins et al. in view of Cook et al. also teach the claimed limitation, as stated above with respect to claims 8-10.

In re claims 59 and 60, Collins et al. in view of Cook also inherently teach that said temperature of said at least one localized region is increased and decreased during said cooling stage because temperature is increasing and decreasing (i.e. fluctuating) during the process that needs to be controlled by the temperature controller, as stated above.

In re claims 61-63, Collins et al. in view of Cook et al. also teach the gas is supplied by a device 54 below the semiconductor wafer 56, located above the semiconductor wafer 56 and the device 54 comprises the gas pipe 64 having a plurality of gas outlets 64a-64d, as stated above.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee
Examiner
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A handwritten signature in black ink, appearing to read 'Lee', with a long horizontal stroke extending to the right.

August 2, 2003